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SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

PTOL-90A (Rev. 10/06)

		Application No.	Applicant(s)
Office Action Summary		10/037,085	MAXHAM, KENNETH M.
		Examiner	Art Unit
		Christina Y. Leung	2613

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on <u>04 December 2006 and 03 January 2007</u>.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) <u>1-35</u> is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) <u>1-35</u> is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☐ Notice of References Cited (PTO-892)
2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____.
5)☐ Notice of Informal Patent Application
6)☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1.   A request for continued examination under 37 CFR 1.114, including the fee set forth in

37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible

for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been

timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR

1.114. Applicant's submission filed on 04 December 2006 has been entered.

Claim Rejections - 35 USC § 102

2.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the

basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed
> in the United States before the invention by the applicant for patent or (2) a patent granted on an application for
> patent by another filed in the United States before the invention by the applicant for patent, except that an
> international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this
> subsection of an application filed in the United States only if the international application designated the United
> States and was published under Article 21(2) of such treaty in the English language.

3.   **Claim 28** is rejected under 35 U.S.C. 102(e) as being anticipated by Cardwell et al. (US

2002/00366988 A1).

       Regarding claim 28, Cardwell et al. disclose a network design tool for a wavelength

division multiplexed optical network in which each optical node is capable of receiving a

plurality of optical amplifiers (page 5, paragraphs [0055]-[0058]; page 7, paragraphs [0075]-

[0076]), comprising:

       selection means for placing at least one optical amplifier to form an initial placement of

amplifiers in accord with an optical power criteria (page 5, paragraphs [0056]-[0058]);

wherein the initial placement is constrained by a node loss algorithm wherein it is

determined if a given node has an internal node loss for one or more channels that exceeds a

predetermined level (page 6, paragraph [0068]; page 7, paragraph [0076]); and a sequential path

search algorithm wherein the power characteristics of one or more channels are analyzed from

add point to drop point (page 7, paragraph [0076]);

means for forming a subsequent set of optical amplifier placement configurations in

.accord with and constrained by the initial placement of the selection means (Figure 5; page 3,

paragraph [0026]; page 6, paragraph [0065] and [0068]; page 7, paragraphs [0071]-[0078]; page

8, paragraphs [0079]-[0082]); and

quality of service means to analyze the quality of service of each amplifier placement

configuration (page 6, paragraph [0068]; page 7, paragraph [0076]).

With respect to a node loss algorithm, Examiner respectfully notes that Cardwell et al.

disclose that the constraining criterion includes "an additional loss component for splicing

through an intermediate office--an office loss in dB per office. The office loss is included to

more accurately model metropolitan areas where distances are short but many offices are used as

via points" (page 6, paragraph [0068]). Further regarding a node loss algorithm, Cardwell et al.

also disclose that the criterion includes "a loss per office for each office or node 12 traversed

without a multiplexer. Thus a 'through' office or node 12 will add to the signal loss" (page 7,

paragraph [0076]).

With respect to a sequential path search algorithm, Examiner respectfully notes that

Cardwell et al. disclose that the constraining criterion also includes "calculat[ing] the signal loss

for each link between add/drop multiplexers on the ring. If the loss thus calculated exceeds the

loss allowed by the multiplexer...routine 116 will insert an amplifier (in the case of DWDM) at

the last office or node before the loss budget was exceeded" (page 7, paragraph [0076]). In other

words, Cardwell et al. disclose that the constraining criterion includes analyzing the power

characteristics of one or more channels from add point (one add/drop multiplexer) to drop point

(another add/drop multiplexer).

Examiner notes that Cardwell et al. disclose "forming a subsequent set of amplifier

placement configurations" by forming a set of possible ring networks, wherein each possible ring

network includes amplifiers placed in accord with an optical power criteria (page 3, paragraph

[0026]; page 7, paragraphs [0075]-[0076]). Examiner also respectfully notes that in the system

disclosed by Cardwell et al., a number of amplifier placement configurations are inherently

formed after or "subsequent to" the first configuration determined by the system.

Examiner further notes that the claim does not recite any further specific details regarding

how a subsequent set of placement configurations is "constrained by" the initial placement.

Cardwell et al. disclose subsequent placement configurations "constrained by" an "initial" or

earlier placement at least in the sense that the placement configurations determined by system are

different from each other and subsequent configurations do not repeat previous/initial

configurations. Therefore, an initial placement determined by the system disclosed by Cardwell

et al. "constrains" subsequent placements in that subsequent placements do not comprise a repeat

of the initial one.

Claim Rejections - 35 USC § 103

4.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5.   **Claims 29-31** are rejected under 35 U.S.C. 103(a) as being unpatentable over Cardwell et

al. in view of Ramamurthy et al. ("Optimizing Amplifier Placements in a Multiwavelength

Optical LAN/MAN: The Unequally Powered Wavelengths Case," IEEE/ACM Transactions on

Networking, Vol. 6, No. 6, December 1998, pp. 755-767).

        Regarding claim 29, Cardwell et al. disclose a network design tool (Figure 5),

comprising:

        a network configuration module (including step 111 in Figure 5; page 7, paragraph

[0071]) for configuring optical components of nodes of an optical network to add, drop, and

pass-through wavelength channels according to a channel map;

        an amplifier placement selection module (including step 116) for selecting a subset of

amplifier placement configurations from the set of all possible amplifier placement

configurations, the selection constrained by a node loss algorithm wherein it is determined if a

given node has an internal node loss for one or more channels that exceeds a predetermined level

(page 6, paragraph [0068]; page 7, paragraph [0076]); and a sequential path search algorithm

wherein the power characteristics of one or more channels are analyzed from add point to drop

point (page 7, paragraph [0076]);

        a quality of service analysis module (including step 118; page 8, paragraph [0079])

configured to analyze the quality of service for each amplifier configuration of the subset of

amplifier placement configurations and select an amplifier configuration having a desired quality

of service.

With respect to a node loss algorithm, Examiner respectfully notes that Cardwell et al.

disclose that the constraining criterion includes "an additional loss component for splicing

through an intermediate office--an office loss in dB per office. The office loss is included to

more accurately model metropolitan areas where distances are short but many offices are used as

via points" (page 6, paragraph [0068]). Further regarding a node loss algorithm, Cardwell et al.

also disclose that the criterion includes "a loss per office for each office or node 12 traversed

without a multiplexer. Thus a 'through' office or node 12 will add to the signal loss" (page 7,

paragraph [0076]).

With respect to a sequential path search algorithm, Examiner respectfully notes that

Cardwell et al. disclose that the constraining criterion also includes "calculat[ing] the signal loss

for each link between add/drop multiplexers on the ring. If the loss thus calculated exceeds the

loss allowed by the multiplexer...routine 116 will insert an amplifier (in the case of DWDM) at

the last office or node before the loss budget was exceeded" (page 7, paragraph [0076]). In other

words, Cardwell et al. disclose that the constraining criterion includes analyzing the power

characteristics of one or more channels from add point (one add/drop multiplexer) to drop point

(another add/drop multiplexer).

Cardwell et al. do not specifically disclose selecting a minimum number of amplifiers,

but they do disclose attempting to minimize overall cost (page 2, paragraph [0021]), and it is

well understood in the art that reducing the number of amplifiers would generally contribute to

reducing an overall cost of the designed system.

Ramamurthy et al. teach a related system for designing an optical wavelength division

multiplexing network (Abstract) including placing optical amplifiers, and they further teach

minimizing the number of amplifiers placed in the network (Abstract, particularly lines 7-9; see

also page 756, section "B. Problem Definition").

It would have been obvious to a person of ordinary skill in the art to select a minimum

number of amplifiers as taught by Ramamurthy et al. in the system disclosed by Cardwell et al.

in order to minimize the cost of the designed network and also in order to advantageously reduce

associated noise and maintenance considerations for each amplifier (Ramamurthy et al., page

756, second paragraph under section "B. Problem Definition").

Regarding claim 30, Cardwell et al. disclose that the amplifier placement selection

module places amplifiers proximate high loss regions of the optical network (page 6, paragraph

[0068]).

Regarding claim 31, Cardwell et al. disclose that the amplifier placement selection

module eliminates from consideration amplifier configurations belonging to branches of a

decision tree likely to have unacceptably low power for at least one wavelength channel in at

least one node (page 6, paragraph [0068]; page 7, paragraphs [0076]-[0077]).

6.   **Claims 1-3, 7-10, 14, 32 and 34** are rejected under 35 U.S.C. 103(a) as being

unpatentable over Cardwell et al. in view of Beine et al. (US 6,304,347 B1).

Regarding claim 1, Cardwell. et al. disclose for a wavelength division multiplexed

optical network having a plurality of optical nodes coupled by spans (Figures 1-4), a computer

implemented method (Figure 5) of selecting amplifier placement, the method comprising:

selecting an optical power criterion for constraining an initial placement of one or more

optical amplifiers in the optical network, the optical power criterion being indicative of a

sufficient minimum received power in at least one receiver (page 7, paragraph [0076]);

wherein the optical power criterion constrains by a node loss algorithm wherein it is

determined if a given node has an internal node loss for one or more channels that exceeds a

predetermined level (page 6, paragraph [0068]; page 7, paragraph [0076]); and a sequential path

search algorithm wherein the power characteristics of one or more channels are analyzed from

add point to drop point (page 7, paragraph [0076]);

placing at least one amplifier in accord with the optical power criterion to form an initial

placement of amplifiers (page 7, paragraph [0076]); and

determining a subsequent set of amplifier placement configurations which are consistent

with and constrained by the initial placement of amplifiers (page 8, paragraphs [0079]-[0081]).

Regarding claim 8, Cardwell et al. disclose for a wavelength division multiplexed

optical network having a plurality of optical nodes coupled by spans (Figures 1-4), a computer

implemented method (Figure 5) of selecting amplifier placement, the method comprising:

selecting a plurality of light paths of the optical network (page 6, paragraphs [0062]-

[0064]);

for each selected light path, placing optical amplifiers in node locations requiring optical

amplification to form an initial placement of amplifiers (page 7, paragraph [0076]);

wherein the optical power criterion constrains by a node loss algorithm wherein it is

determined if a given node has an internal node loss for one or more channels that exceeds a

predetermined level (page 6, paragraph [0068]; page 7, paragraph [0076]); and a sequential path

search algorithm wherein the power characteristics of one or more channels are analyzed from

add point to drop point (page 7, paragraph [0076]); and

determining a subsequent set of amplifier placement configurations which are consistent

with and constrained by the initial placement of amplifiers (page 8, paragraphs [0079]-[0081]).

Regarding both claims 1 and 8, with respect to a node loss algorithm, Examiner

respectfully notes that Cardwell et al. disclose that the constraining criterion includes "an

additional loss component for splicing through an intermediate office--an office loss in dB per

office. The office loss is included to more accurately model metropolitan areas where distances

are short but many offices are used as via points" (page 6, paragraph [0068]). Further regarding a

node loss algorithm, Cardwell et al. also disclose that the criterion includes "a loss per office for

each office or node 12 traversed without a multiplexer. Thus a 'through' office or node 12 will

add to the signal loss" (page 7, paragraph [0076]).

Regarding both claims 1 and 8, with respect to a sequential path search algorithm,

Examiner respectfully notes that Cardwell et al. disclose that the constraining criterion also

includes "calculat[ing] the signal loss for each link between add/drop multiplexers on the ring. If

the loss thus calculated exceeds the loss allowed by the multiplexer...routine 116 will insert an

amplifier (in the case of DWDM) at the last office or node before the loss budget was exceeded"

(page 7, paragraph [0076]). In other words, Cardwell et al. disclose that the constraining criterion

includes analyzing the power characteristics of one or more channels from add point (one

add/drop multiplexer) to drop point (another add/drop multiplexer).

Regarding both claims 1 and 8, as similarly discussed above with regard to claim 28,

Examiner notes that Cardwell et al. disclose "determining a set of amplifier placement

configurations" by forming a set of possible ring networks, wherein each possible ring network

includes amplifiers placed in accord with an optical power criteria (page 3, paragraph [0026];

page 7, paragraphs [0075]-[0076]). Examiner also respectfully notes that in the system disclosed

by Cardwell et al., a number of amplifier placement configurations are inherently formed after or

"subsequent to" the first configuration determined by the system. Also, Examiner further notes

that the claims do not recite any further specific details regarding how a subsequent set of

placement configurations is "constrained by" the initial placement. Cardwell et al. disclose

subsequent placement configurations "constrained by" an "initial" or earlier placement at least in

the sense that the placement configurations determined by system are different from each other

and subsequent configurations do not repeat previous/initial configurations. Therefore, an initial

placement determined by the system disclosed by Cardwell et al. "constrains" subsequent

placements in that subsequent placements do not comprise a repeat of the initial one.

Further regarding both claims 1 and 8, Cardwell et al. disclose that each node is capable

of generally receiving amplifiers, but they do not specifically disclose pre-amplifiers and post-

amplifiers. However, Beine et al. teach a related optical network with nodes coupled by fiber

optic spans (Figure 21) and further teach nodes capable of receiving at least one optical pre-

amplifier for each input fiber and at least one optical post amplifier for each output fiber (such as

amplifiers 2102 and 2106, for example; column 36, lines 38-53). It would have been obvious to a

person of ordinary skill in the art to specifically have the nodes disclosed by Cardwell et al.

capable of receiving both pre- and post-amplifiers as suggested by Beine et al. in order to

provide more flexibility in the placement of the amplifiers and thereby better optimize the design

of the network.

Regarding claims 7 and 14, Cardwell et al. in view of Beine et al. suggest a network

designed by the method of claim 1 as discussed above.

Regarding claims 2 and 9, Cardwell et al. disclose that the optical power criterion

comprises:

placing an amplifier in a pre-selected node location responsive to an optical loss

associated with at least one portion of a lightpath of the network exceeding a threshold loss (page

7, paragraph [0076]).

Regarding claims 3 and 10, Cardwell et al. disclose the optical criterion comprises:

analyzing the power level of at least one wavelength channel from a source node and placing an

amplifier at a node location prior to a first node location in which the power level decreases

below a threshold power level (page 7, paragraph [0076]).

Regarding claim 32, Cardwell et al. disclose a wavelength division multiplexed optical

network (Figures 1-4), comprising:

at least four optical nodes coupled by fiber optic spans, each node having an optical

add/drop multiplexer (Figure 4 shows four nodes 18, 20, 22b, and 24b with add/drop

multiplexers) and

at least one optical amplifier disposed in the nodes, wherein the configuration of the at

least one optical amplifier is selected and validated by a design tool, the selection constrained by

a node loss algorithm wherein it is determined if a given node has an internal node loss for one

or more channels that exceeds a predetermined level (page 6, paragraph [0068]; page 7,

paragraph [0076]); and a sequential path search algorithm wherein the power characteristics of

one or more channels are analyzed from add point to drop point (page 7, paragraph [0076]).

With respect to a node loss algorithm, Examiner respectfully notes that Cardwell et al.

disclose that the constraining criterion includes "an additional loss component for splicing

through an intermediate office--an office loss in dB per office. The office loss is included to

more accurately model metropolitan areas where distances are short but many offices are used as

via points" (page 6, paragraph [0068]). Further regarding a node loss algorithm, Cardwell et al.

also disclose that the criterion includes "a loss per office for each office or node 12 traversed

without a multiplexer. Thus a 'through' office or node 12 will add to the signal loss" (page 7,

paragraph [0076]).

        With respect to a sequential path search algorithm, Examiner respectfully notes that

Cardwell et al. disclose that the constraining criterion also includes "calculat[ing] the signal loss

for each link between add/drop multiplexers on the ring. If the loss thus calculated exceeds the

loss allowed by the multiplexer...routine 116 will insert an amplifier (in the case of DWDM) at

the last office or node before the loss budget was exceeded" (page 7, paragraph [0076]). In other

words, Cardwell et al. disclose that the constraining criterion includes analyzing the power

characteristics of one or more channels from add point (one add/drop multiplexer) to drop point

(another add/drop multiplexer).

        Cardwell et al. disclose that each node is capable of generally receiving amplifiers, but

they do not specifically disclose pre-amplifiers and post-amplifiers. However, Beine et al. teach a

related optical network with nodes coupled by fiber optic spans (Figure 21) and further teach

nodes capable of receiving at least one optical pre-amplifier for each input fiber and at least one

optical post amplifier for each output fiber (such as amplifiers 2102 and 2106, for example;

column 36, lines 38-53). It would have been obvious to a person of ordinary skill in the art to

specifically have the nodes disclosed by Cardwell et al. capable of receiving both pre- and post-

amplifiers as suggested by Beine et al. in order to provide more flexibility in the placement of the

amplifiers and thereby better optimize the design of the network.

Regarding claim 34, Cardwell et al. disclose that the network has at least five nodes

(Figures 1-4 show more than five nodes in a network).

7.   **Claim 33** is rejected under 35 U.S.C. 103(a) as being unpatentable over Cardwell in view

of Beine et al. as applied to claim 32 above, and further in view of Sharma et al. (US 6,046,833

A).

Regarding claim 33, Cardwell et al. in view of Beine et al. describe a system as

discussed above with regard to claim 32. Cardwell et al. further disclose OC-3, OC-12, and OC-

48 services (page 9, Table 2) but do not specifically disclose OC-192 compliant services.

However, OC-192 compliant services are also well known in the art in optical networks, as

Sharma et al. specifically suggest (column 2, lines 11-24). It would have been obvious to a

person of ordinary skill in the art to specifically use OC-192 compliant services as taught by

Sharma et al. in the network described by Cardwell et al. in view of Beine et al. in order to

accommodate greater transmission rates and deliver large amounts of communication more

efficiently.

8.   **Claims 4-6, 11-13, and 35** are rejected under 35 U.S.C. 103(a) as being unpatentable

over Cardwell in view of Beine et al. as applied to claims 1, 8, and 32 above, and further in view

of Ramamurthy et al.

Regarding claims 4-6 and 11-13, Cardwell et al. in view of Beine et al. describe a

method as discussed above with regard to claims 1 and 8 respectively. Regarding claims 5-6 and

12-13 in particular, Cardwell et al. further teach performing a quality of service analysis upon

each of the amplifier placement configurations; and selecting the amplifier placement

configuration having a desired level of service (page 7, paragraph [0076]).

Cardwell et al. do not specifically disclose selecting the amplifier placement having a

minimum number of optical amplifiers or that the optical power criterion comprises calculating

an aggregate loss or determining an aggregate number of amplifiers.

However, Ramamurthy et al. teach a related system for designing an optical wavelength

division multiplexing network (Abstract) including placing optical amplifiers, and they further

teach minimizing the number of amplifiers placed in the network by calculating an aggregate

loss of the network spans and nodes and determining an aggregate number of amplifiers required

for the aggregate optical loss (Abstract, particularly lines 7-9; see also page 756, section "B.

Problem Definition").

Cardwell et al. already disclose attempting to minimize overall cost (page 2, paragraph

[0021]), and it is well understood in the art that reducing the number of amplifiers would

generally contribute to reducing an overall cost of the designed system.

Regarding claims 4, 5, 11, and 12, it would have been obvious to a person of ordinary

skill in the art to select a minimum number of amplifiers by calculating an aggregate loss as

taught by Ramamurthy et al. in the system disclosed by Cardwell et al. in order to minimize the

cost of the designed network and also in order to advantageously reduce associated noise and

maintenance considerations for each amplifier (Ramamurthy et al., page 756, second paragraph

under section "B. Problem Definition").

Regarding claims 6 and 13, Cardwell et al. in view of Beine et al. and Ramamurthy et al.

suggest a network designed by the methods of claims 5 and 12 as discussed above.

Regarding claim 35, Cardwell et al. in view of Beine et al. describe a system as discussed above with regard to claim 32. Cardwell et al. further disclose that design tool performs the steps of:

selecting a subset of optical amplifier placement configurations (page 5, paragraphs [0056]-[0058]);

analyzing quality of service for each optical amplifier placement configuration in the subset of optical amplifier placement configuration (Figure 5; page 3, paragraph [0026]; page 6, paragraph [0065] and [0068]; page 7, paragraphs [0071]-[0078]); and

selecting an optical amplifier placement configuration having a desired quality of service (page 8, paragraphs [0079]-[0082]).

As similarly discussed above with regard to claim 29, Cardwell et al. do not specifically disclose selecting a minimum number of amplifiers, but they do disclose attempting to minimize overall cost (page 2, paragraph [0021]), and it is well understood in the art that reducing the number of amplifiers would generally contribute to reducing an overall cost of the designed system.

Ramamurthy et al. teach a related system for designing an optical wavelength division multiplexing network (Abstract) including placing optical amplifiers, and they further teach minimizing the number of amplifiers placed in the network (Abstract, particularly lines 7-9; see also page 756, section "B. Problem Definition").

It would have been obvious to a person of ordinary skill in the art to select a minimum number of amplifiers as taught by Ramamurthy et al. in the system disclosed by Cardwell et al. in order to minimize the cost of the designed network and also in order to advantageously reduce

associated noise and maintenance considerations for each amplifier (Ramamurthy et al., page

756, second paragraph under section "B. Problem Definition").

9.   **Claims 15-27** are rejected under 35 U.S.C. 103(a) as being unpatentable over Cardwell et

al. in view of Beine et al. and Ramamurthy et al.

Regarding claim 15, Cardwell et al. disclose a computer implemented method for

designing a wavelength division multiplexed optical network (Figure 5), the method comprising:

providing an interface for a user to input an arrangement of optical nodes coupled by

optical fiber spans (page 5, paragraphs [0055]-[0058]; page 6, paragraphs [0061]-0062]), each of

the optical fiber spans having an associated optical fiber loss that is dependent upon its length

and upon an attenuation characteristic of the span (page 7, paragraph [0076]);

the optical network having an associated multiplicity of possible optical amplifier

placement configurations;

for each node of the optical network, configuring optical components of optical add/drop

multiplexers to add, drop, and pass through optical wavelength channels according to a channel

map for providing services in the optical network, the optical components of the node having an

associated optical loss characteristic (page 6, paragraphs [0062]-[0064]);

selecting a set of optical amplifier placement configurations, the selection constrained by

a node loss algorithm wherein it is determined if a given node has an internal node loss for one

or more channels that exceeds a predetermined level (page 6, paragraph [0068]; page 7,

paragraph [0076]); and a sequential path search algorithm wherein the power characteristics of

one or more channels are analyzed from add point to drop point (page 7, paragraph [0076]);

analyzing quality of service for each optical amplifier placement configuration in the set

of optical amplifier placement configurations (page 6, paragraph [0065] and [0068]); and

selecting an optical amplifier placement configuration having a desired quality of service

(page 8, paragraphs [0079]-[0082]).

With respect to a node loss algorithm, Examiner respectfully notes that Cardwell et al.

disclose that the constraining criterion includes "an additional loss component for splicing

through an intermediate office--an office loss in dB per office. The office loss is included to

more accurately model metropolitan areas where distances are short but many offices are used as

via points" (page 6, paragraph [0068]). Further regarding a node loss algorithm, Cardwell et al.

also disclose that the criterion includes "a loss per office for each office or node 12 traversed

without a multiplexer. Thus a 'through' office or node 12 will add to the signal loss" (page 7,

paragraph [0076]).

With respect to a sequential path search algorithm, Examiner respectfully notes that

Cardwell et al. disclose that the constraining criterion also includes "calculat[ing] the signal loss

for each link between add/drop multiplexers on the ring. If the loss thus calculated exceeds the

loss allowed by the multiplexer...routine 116 will insert an amplifier (in the case of DWDM) at

the last office or node before the loss budget was exceeded" (page 7, paragraph [0076]). In other

words, Cardwell et al. disclose that the constraining criterion includes analyzing the power

characteristics of one or more channels from add point (one add/drop multiplexer) to drop point

(another add/drop multiplexer).

Regarding claim 15, Cardwell et al. disclose that each node is capable of generally

receiving amplifiers, but they do not specifically disclose pre-amplifiers and post-amplifiers.

However, Beine et al. teach a related optical network with nodes coupled by fiber optic spans (Figure 21) and further teach nodes capable of receiving at least one optical pre-amplifier for each input fiber and at least one optical post amplifier for each output fiber (such as amplifiers 2102 and 2106, for example; column 36, lines 38-53). It would have been obvious to a person of ordinary skill in the art to specifically have the nodes disclosed by Cardwell et al. capable of receiving both pre- and post-amplifiers as suggested by Beine et al. in order to provide more flexibility in the placement of the amplifiers and thereby better optimize the design of the network.

Further regarding claim 15, Cardwell et al. do not specifically disclose selecting a minimum number of amplifiers, but they do disclose attempting to minimize overall cost (page 2, paragraph [0021]), and it is well understood in the art that reducing the number of amplifiers would generally contribute to reducing an overall cost of the designed system.

Ramamurthy et al. teach a related system for designing an optical wavelength division multiplexing network (Abstract) including placing optical amplifiers, and they further teach minimizing the number of amplifiers placed in the network (Abstract, particularly lines 7-9; see also page 756, section "B. Problem Definition").

It would have been obvious to a person of ordinary skill in the art to select a minimum number of amplifiers as taught by Ramamurthy et al. in the system disclosed by Cardwell et al. in order to minimize the cost of the designed network and also in order to advantageously reduce associated noise and maintenance considerations for each amplifier (Ramamurthy et al., page 756, second paragraph under section "B. Problem Definition").

Regarding claim 27, Cardwell et all. in view of Beine et al. and Ramamurthy et al.

suggest an optical network designed by the method of claim 15 as discussed above.

Regarding claim 16, Cardwell et al. disclose that selecting the set comprises:

selecting an optical power criterion for constraining placement of one or more optical

amplifiers in the optical network, the optical power criterion being indicative of a sufficient

minimum received power in at least one receiver (page 5, paragraph [0058]; page 6, paragraphs

[0065] and [0068]);

placing at least one amplifier in accord with the optical power criterion to form an initial

placement of amplifiers (page 7, paragraph [0076]); and

determining a set of amplifier placement configurations which are consistent with the

initial placement of amplifiers (page 8, paragraphs [0079]-[0081])..

Regarding claim 17, Cardwell et al. disclose that selecting the set comprises:

for a node having at least one channel passing through the node, determining a pass-

through optical loss associated with the at least one channel passing through the optical node;

responsive to the pass-through optical loss exceeding a threshold loss, placing at least one

amplifier in the node (page 6, paragraph [0068].

Regarding claim 18, Cardwell et al. disclose that selecting the set comprises:

for at least one optical wavelength channel, forming an equivalent optical circuit model

having an associated equivalent optical loss to couple a wavelength channel from a first node to a

second node in the network; and responsive to the equivalent optical loss exceeding a threshold

optical loss, placing an optical amplifier in at least one of the nodes (page 7, paragraph [0076]).

Regarding claim 19, Cardwell et al. disclose that the first and second nodes comprise an optical add/drop path, the minimum equivalent loss includes the losses along the add/drop path, and the optical amplifier is placed in one of the nodes along the add/drop path (page 7, paragraph [0076]).

Regarding claim 20, Cardwell et al. disclose that selecting the set comprises:

for at least one optical wavelength channel that is added and dropped, sequentially moving from an add node to each subsequent node along an optical path to a drop node;

at each node in the sequence of nodes along the optical path, determining if an optical amplifier is required to couple the optical wavelength signal to a subsequent node; and

responsive to determining that an optical amplifier is required to couple the optical wavelength channel to a subsequent node, placing an amplifier in a node location selected to couple the optical wavelength signal to the subsequent node (page 7, paragraph [0076]);.

Regarding claim 21, Cardwell et al. disclose:

performing a power analysis of the wavelength channel along the optical path for an initial optical amplifier configuration; and

responsive to the wavelength channel having a power level below a threshold power level in a node, placing an optical amplifier in a previous node (page 6, paragraph [0068]; page 7, [0076]).

Regarding claim 22, Cardwell et al. disclose that selecting the set comprises: placing amplifiers proximate high loss regions of the optical network (page 7, paragraph [0076]).

Regarding claim 23, Cardwell et al. disclose that selecting the set further comprises:

eliminating from consideration amplifier configurations belonging to branches of a decision tree

likely to have unacceptably low power for at least one wavelength channel in at least one node

(page 6, paragraph [0068]; page 7, paragraphs [0076]-[0077]).

Regarding claim 24, Cardwell et al. disclose that selecting the set comprises:

placing an optical amplifier in a node, responsive to the optical loss of the node for at

least one pass-through channel exceeding a first threshold loss; and

placing at least one amplifier proximate one end of a span responsive to determining a

path loss for a wavelength channel added in a first node traveling along an optical path including

the span to a second node exceeding a second threshold loss (page 7, paragraph [0076]).

Examiner notes that Cardwell et al. disclose placing optical amplifiers in nodes wherever

the loss of a signal has exceeded a threshold loss for a given link. Different links would have

different loss characteristics and so the system disclosed by Cardwell et al. is capable of placing

an amplifier when the loss on one link has exceeded a first threshold and another amplifier when

the loss on another link has exceeded a second threshold.

Regarding claim 25, Cardwell et al. disclose forming configurations having at least one

additional optical amplifier (i.e., they disclose placing however many amplifiers as needed).

Regarding claim 26, Cardwell et al. in view of Beine et al. and Ramamurthy et al.

describe a method as discussed above with regard to claim 15. Cardwell et al. do not specifically

disclose selecting the amplifier placement by calculating an aggregate loss or determining an

aggregate number of amplifiers.

However, Ramamurthy et al. teach a related system for designing an optical wavelength

division multiplexing network (Abstract) including placing optical amplifiers, and they further

teach minimizing the number of amplifiers placed in the network by calculating an aggregate

loss of the network spans and nodes and determining an aggregate number of amplifiers required

for the aggregate optical loss (Abstract, particularly lines 7-9; see also page 756, section "B.

Problem Definition").

Cardwell et al. already disclose attempting to minimize overall cost (page 2, paragraph

[0021]), and it is well understood in the art that reducing the number of amplifiers would

generally contribute to reducing an overall cost of the designed system.

Regarding claim 26, it would have been obvious to a person of ordinary skill in the art to

select a minimum number of amplifiers by calculating an aggregate loss as taught by

Ramamurthy et al. in the method described by Cardwell et al. in view of Beine et al. and

Ramamurthy et al. in order to minimize the cost of the designed network and also in order to

advantageously reduce associated noise and maintenance considerations for each amplifier

(Ramamurthy et al., page 756, second paragraph under section "B. Problem Definition").

Response to Arguments

10.   Applicant's arguments filed 04 December 2006 have been fully considered but they are

not persuasive.

Examiner respectfully disagrees with Applicant's assertion on page 13 of the response

that "Cardwell et al. do not disclose a node loss algorithm used with one or more of a path loss

algorithm, an aggregate loss algorithm, or a sequential path algorithm...." On the contrary,

Examiner respectfully submits that Cardwell et al. disclose at least a node loss algorithm and a

sequential path algorithm as recited in the claims and as discussed in greater detail in the

rejections above. In particular with respect to a sequential path search algorithm, Examiner

respectfully notes that Cardwell et al. disclose that the constraining criterion also includes "calculat[ing] the signal loss for each link between add/drop multiplexers on the ring. If the loss thus calculated exceeds the loss allowed by the multiplexer...routine 116 will insert an amplifier (in the case of DWDM) at the last office or node before the loss budget was exceeded" (page 7, paragraph [0076]). In other words, Cardwell et al. disclose that the constraining criterion includes analyzing the power characteristics of one or more channels from add point (one add/drop multiplexer) to drop point (another add/drop multiplexer).
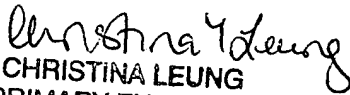
Conclusion

11.   Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 571-272-3023. The examiner can normally be reached on Monday to Friday, 6:30 to 3:00.

        If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

        Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

        Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CHRISTINA LEUNG
PRIMARY EXAMINER